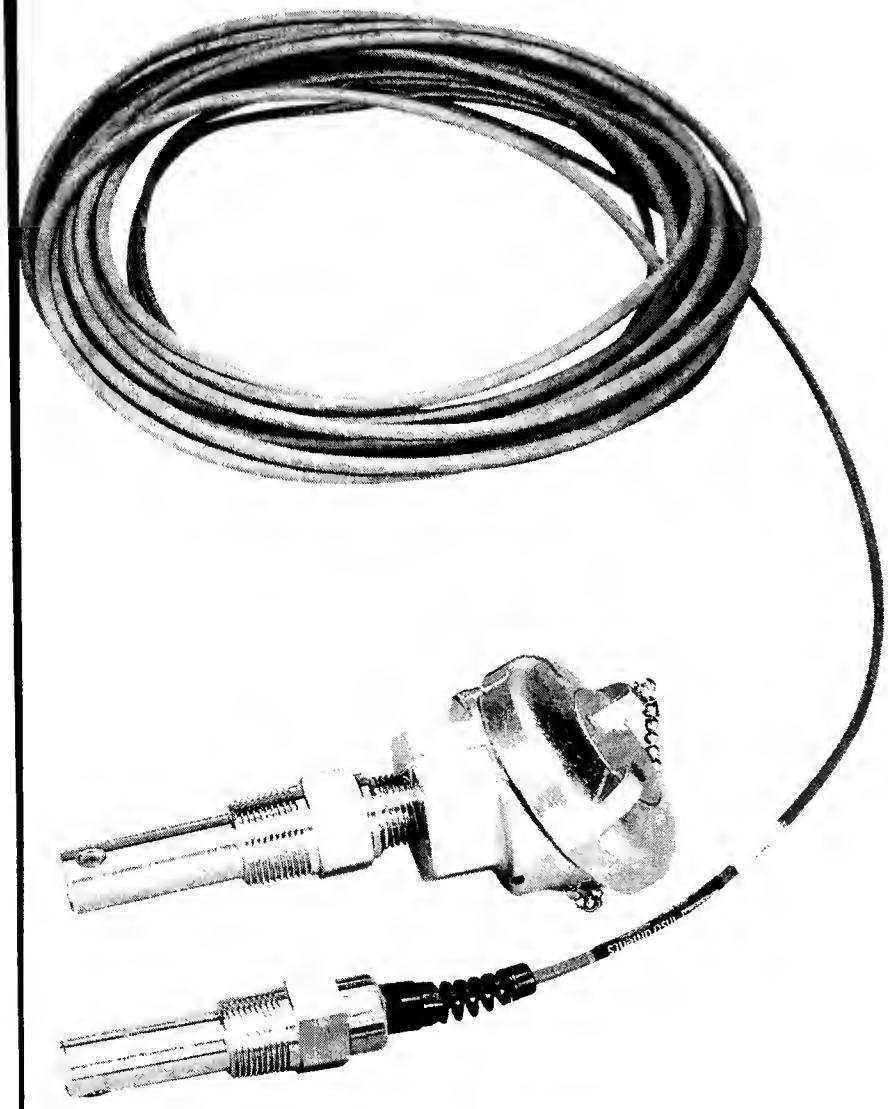
.1 YEAR
WARRANTY

MADE IN
USA

CE

User's Guide



Shop online at

omega.com®
OMEGA®

www.omega.com
e-mail: info@omega.com

ISO 9001 CERTIFIED CORPORATE QUALITY
STAMFORD, CT

ISO 9002 CERTIFIED CORPORATE QUALITY
MANCHESTER, UK

CDE683 SERIES
Boiler Condensate Sensors

omega.com®
ΩOMEGA®

OMEGAnet® Online Service www.omega.com	Internet e-mail info@omega.com

Servicing North America:

USA:
ISO 9001 Certified
One Omega Drive, P.O. Box 4047
Stamford CT 06907-0047
TEL: (203) 359-1660 FAX: (203) 359-7700
e-mail: info@omega.com

Canada:
976 Bergar
Laval (Quebec) H7L 5A1, Canada
TEL: (514) 856-6928 FAX: (514) 856-6886
e-mail: info@omega.ca

For immediate technical or application assistance:

USA and Canada: Sales Service: 1-800-826-6342 / 1-800-TC-OMEGA®
Customer Service: 1-800-622-2378 / 1-800-622-BEST®
Engineering Service: 1-800-872-9436 / 1-800-USA-WHEN®
TELEX: 996404 EASYLINK: 62968934 CABLE: OMEGA

Mexico: En Español: (001) 203-359-7803 e-mail: espanol@omega.com
FAX: (001) 203-359-7807 info@omega.com.mx

Servicing Europe:

Benelux:
Postbus 8034, 1180 LA Amstelveen, The Netherlands
TEL: +31 (0)20 3472121 FAX: +31 (0)20 6434643
Toll Free in Benelux: 0800 0993344
e-mail: sales@omegaeng.nl

Czech Republic:
Frystatska 184/46, 733 01 Karviná, Czech Republic
TEL: +420 (0)59 6311899 FAX: +420 (0)59 6311114
Toll Free: 0800-1-66342 e-mail: info@omegashop.cz

France:
11, rue Jacques Cartier, 78280 Guyancourt, France
TEL: +33 (0)1 61 37 29 00 FAX: +33 (0)1 30 57 54 27
Toll Free in France: 0800 466 342
e-mail: sales@omega.fr

Germany/Austria:
Daimlerstrasse 26, D-75392 Deckenpfronn, Germany
TEL: +49 (0)7056 9398-0 FAX: +49 (0)7056 9398-29
Toll Free in Germany: 0800 639 7678
e-mail: info@omega.de

United Kingdom:
ISO 9002 Certified
One Omega Drive, River Bend Technology Centre
Northbank, Irlam, Manchester
M44 5BD United Kingdom
TEL: +44 (0)161 777 6611 FAX: +44 (0)161 777 6622
Toll Free in United Kingdom: 0800-488-488
e-mail: sales@omega.co.uk

Operating Instruction Manual

CDE683 Series
High Temperature Conductivity Sensors

HELPFUL IDENTIFIERS

In addition to information on installation and operation, this instruction manual may contain WARNINGS pertaining to user safety, CAUTIONS regarding possible sensor malfunction, and NOTES on important, useful operating guidelines.

A WARNING LOOKS LIKE THIS. ITS PURPOSE IS TO WARN THE USER OF THIS SENSOR OF THE POTENTIAL FOR PERSONAL INJURY.

A CAUTION LOOKS LIKE THIS. ITS PURPOSE IS TO ALERT THE USER OF THIS SENSOR TO POSSIBLE MALFUNCTION OR DAMAGE.

☞ ***NOTE:*** *A note looks like this. Its purpose is to alert the user of this sensor to important operating information.*

TABLE OF CONTENTS

PART ONE - INTRODUCTION

SECTION 1
GENERAL INFORMATION

1.1 Description

Benefits of Enhanced Performance Design

CDE683-series high temperature/high pressure style sensors are manufactured to exacting tolerances using high quality, rugged materials for demanding boiler and condensate measuring applications, and for high temperature process measurements. Each sensor is:

- Individually tested to determine its absolute cell constant (shown on its label as K =), and its temperature element value (to the nearest 1.0 ohm). Entering each sensor's OMEGA-certified "K" value and temperature "T" factor during instrument configuration or calibration, ensures the highest possible measurement accuracy.
- Built with a Pt 1000 RTD temperature element located at its tip to provide exceptionally fast response to changes in temperature with high measuring accuracy (± 0.2°C).

Sensor Characteristics

CDE683-series high temperature/high pressure style sensors can be provided in a variety of ways:

Basic Cell Constant: 0.5 or 5.0.

Installation Style: 316 stainless steel body has 3/4-inch male NPT threads which can be threaded directly into a boiler wall, or insertion mounted into a pipe tee.

Termination Style: An integral 20 ft. (6 m) long cable or an integrally-mounted junction box (aluminum, or 316 stainless steel) with 3/4 inch female conduit connection.

1.2 Operating Precautions

Always consider the temperature/pressure ratings of the mounting hardware used to install the sensor. The sensor and hardware combine to become an integrated system. The hardware material usually limits the system's temperature/pressure rating. Refer to Section 2 for complete specifications.

Note: The CDE683 series sensors are designed for use with the CDTX680 series transmitters and CDCN684, CDCN685 and CDCN686 controller analyzers only.

SECTION 2
SPECIFICATIONS

Wetted Materials ..... 316 stainless steel and titanium electrodes, PEEK insulator, and fluoroelastomer O-ring seals

Maximum Temperature ..... Sensor w/Integral Cord Grip:
212°F at 300 psi (100°C at 20.7 bar)

Sensor w/Integral Polypropylene J-box Head:
198°F at 300 psi (92°C at 20.7 bar)

Sensor w/Integral Aluminum or 316 SS J-box Head:
392°F at 300 psi (200°C at 20.7 bar)

Maximum Pressure ..... Sensor w/Integral Cord Grip:
300 psi at 212°F (20.7 bar at 100°C)

Sensor w/Integral Polypropylene J-box Head:
300 psi at 198°F (20.7 bar at 92°C)

Sensor w/Integral Aluminum or 316 SS J-box Head:
300 psi at 392°F (20.7 bar at 200°C)

Flow Rate ..... 0-10 ft. (0-3 m) per second (fully immersed)

Temperature
Compensator ..... Pt 1000 RTD

Sensor Cable:
Integral (no junction box)..... 6 wire cable (4 conductors and two isolated shield wires); 20 ft. (6 m) long

Junction Box Head..... 6-position terminal strip supplied in integrally-mounted junction box (polypropylene, aluminum, or 316 stainless steel)

Model Numbers :

Model No.	Cell Constant	Max. Temp/Pressure	Junction Box
CDE683-B	0.5	100°C at 20.7bar (212°F at 300 psi)	None 20 ft. cable
CDE683-D	5.0	100°C at 20.7bar (212°F at 300 psi)	None 20 ft. cable
CDE683-B-JA	0.5	200°C at 20.7 bar (392°F at 300 psi)	Aluminum
CDE683-D-JA	5.0	200°C at 20.7 bar (392°F at 300 psi)	Aluminum
CDE683-B-JS	0.5	200°C at 20.7 bar (392°F at 300 psi)	316ss
CDE683-D-JS	5.0	200°C at 20.7 bar (392°F at 300 psi)	316ss

Accessory for CDE683 Series sensors: CDE3600-CAB - Inteconnect cable (25 ft min.)

PART TWO - INSTALLATION

SECTION 1
LOCATION REQUIREMENTS

Locate the sensor as close as possible to the measuring instrument. Do not exceed a distance of 300 feet (91 m) between the sensor and instrument.

SECTION 2
MOUNTING

The CDE683-series high temperature/high pressure style sensor can be mounted directly into a boiler wall, or indirectly into a condensate or process line by using a 316 stainless steel tee of an appropriate size. Figure 2-1 shows the sensor's general dimensions.

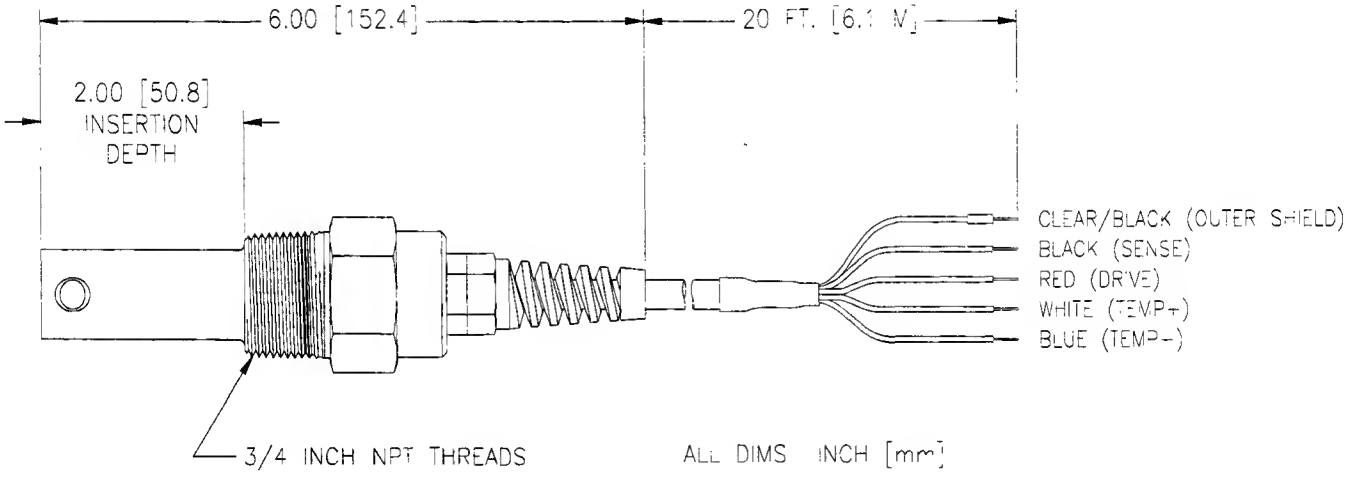


FIGURE 2-1 General Dimensions and Cable Wire Details

To ensure optimum measurement performance, follow these guidelines when mounting the sensor:

- Install the sensor into the vessel or pipe run so that the process flow directly contacts the end of the sensor (see Figure 2-2).
- Preferrably, mount the sensor in a vertical position to eliminate the possibility of trapped air bubbles from contacting its electrodes which can cause measurement error. This also prevents loose pipe line sediment from accumulating and obstructing the sensor electrodes.

2.1 Into Vessel Wall Using a Weldolet

1. Refer to Figure 2-2, and install a 3/4-inch NPT weldolet into the vessel wall.
2. Fasten the sensor into the 3/4-inch NPT threaded hole.

NOTE: *Use a high temperature thread sealant on the sensor threads to avoid leaks.*

3. Electrically connect the sensor to the analyzer. Refer to the analyzer instruction manual for details.
4. Calibrate the analyzer using the procedure in the analyzer instruction manual.

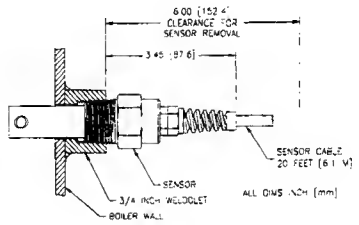


FIGURE 2-2 Installing Sensor Into Vessel Wall Using a Weldolet

2.2 Into Pipe Using a Tee

1. Refer to Figure 2-3, and install a 316 stainless steel pipe tee of appropriate size (1/2 to 2 inches) into the process pipe. **Recommendation:** Use a 3/4-inch pipe tee. If necessary, screw a respectively-sized reducer into the pipe tee.

NOTE: *When the sensor is mounted, its "cross flow" holes should be located at the approximate center of the tee for best performance.*

Use a high temperature thread sealant on the pipe tee threads to avoid leaks.

2. Electrically connect the sensor to the analyzer. Refer to the analyzer instruction manual for details.
3. Calibrate the analyzer using the procedure in the analyzer instruction manual.
4. Fasten the sensor into the installed pipe tee.

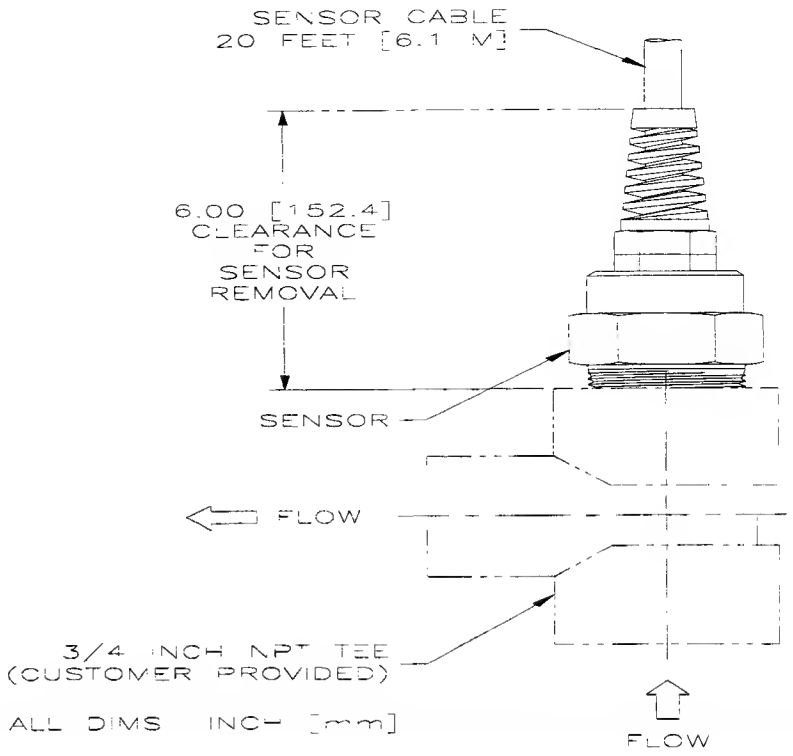


FIGURE 2-3 Installing Sensor Into Pipe Using a Tee

SECTION 3
SENSOR/INTERCONNECT CABLE DETAILS

3.1 Sensor Cable Details

The sensor's integral cable is a 5-wire Teflon-jacketed cable with 4 conductors and one braided shield wire. Refer to Figure 2-1 for the function and color of each wire in the sensor's integral cable.

3.2 Interconnect Cable Details

The OMEGA interconnect cable (part number CDE3600-CAB) is provided with unfinished ends since it must often be shortened during installation. The CDE3600-CAB cable is very similar to the sensor's integral cable except that it has two additional conductors (green and yellow) which are not required. When stripping the interconnect cable during termination, purposely cut off these green and yellow wires from each end of the stripped-back cable. This ensures the same wire color coding used by the sensor's integral cable.

☞ ***NOTE:*** *OMEGA strongly recommends using only its CDE3600-CAB interconnect cable. If a different cable is used, it must have equivalent construction: four conductors, and two separate isolated shields – one shielding the signal, and one shielding the overall cable. These specific cable characteristics protect the measurement signal from electromagnetic interferences. Using a cable with different construction*

may interfere with the measurement system's ability to properly measure.

To correctly terminate the ends of the interconnect cable, refer to Figure 2-4 and follow this procedure:

1. Carefully strip back 2-1/4 inches of the outer cable jacket , the outer shield foil, and the cellophane binder. This exposes the sensor shield wire, the inner shield wire, and the three foil-wrapped wire pairs.
2. Cut off the exposed 2-1/4 inches of only the yellow and green wire pair.
3. Peel back and cut off the exposed inner shield foil from the red/black and blue/white wire pairs.
4. Carefully strip back an additional 1/2 inch of the outer cable jacket and outer shield foil.

☞ ***NOTE:*** *Be careful not to damage the exposed section of the cellophane binder.*

5. Carefully position a 2-1/2 inch long piece of shrink tubing or tape on the bare sensor shield wire 1/4-inch from the end as shown in Figure 2-4 to insulate and distinguish it from the inner shield wire. Doing this exposes 1/4-inch of bare shield wire beyond the tubing or tape for connection purposes.

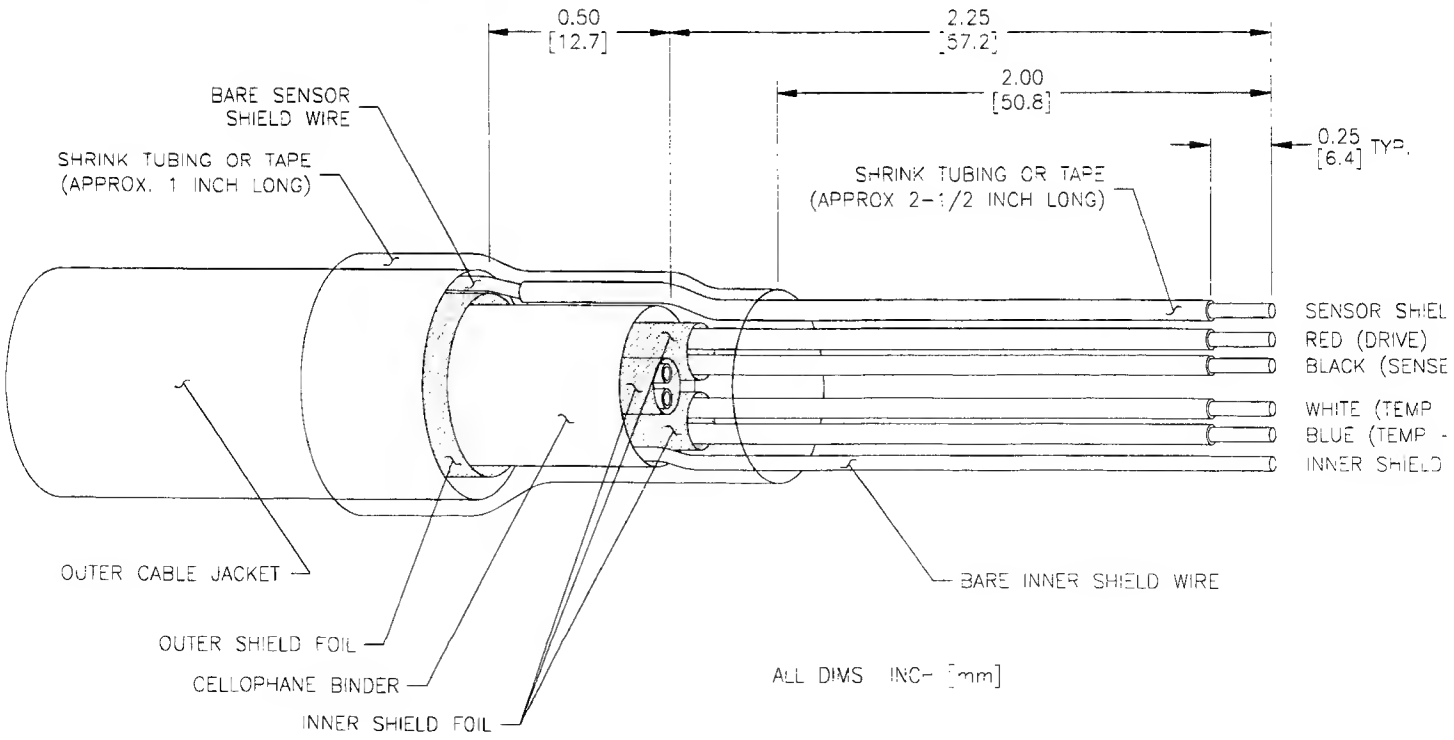


Figure 2-4 Interconnect Cable Termination Details

6. Carefully position a 1-inch long piece of shrink tubing or tape on the cable as shown in Figure 2-4 to secure all wires.

☞ ***NOTE:*** *Do not fold back the cellophane binder exposed in step 4.*

7. Using an ohmmeter or test light, verify that the sensor shield wire you insulated is not shorted to the bare inner shield wire. If the wires are shorted, cut the cable to get a new unfinished end and start over at step 1.

8. Strip 1/4 inch of insulation from the ends of the red, black, white, and blue wires. Tin these leads, the insulated sensor shield wire, and the bare inner shield wire with solder.

9. Connect the interconnect cable to the analyzer in the same way as the sensor cable, by matching colors as indicated.

3.3 Connecting Interconnect Cable

- **To Integral Junction Box Head:** Connect the four colored wires and two shields of the interconnect cable to the six terminals inside the junction box head, following the wire designations shown inside the junction box cover.

- **To Analyzer:** Refer to the instrument instruction manual and connect the interconnect cable wires to appropriate SENSOR terminals in the same way as the sensor wires would be directly connected.

PART THREE - SERVICE AND MAINTENANCE

SECTION 1

RECOMMENDED CLEANING PROCEDURE

Keep the sensor reasonably clean to maintain measurement accuracy. The time between cleanings (days, weeks, etc.) is affected by the characteristics of the process solution and can only be determined by operating experience.

1. Remove most contaminate buildup by carefully wiping the inner electrode rod, and the concentric outer electrode tube (inner and outer surfaces) with a soft clean cloth. Then rinse the sensor with clean, warm water.
2. Prepare a mild soap solution. Use warm water and dishwashing detergent, Borax hand soap, or a similar soap.
3. Soak the sensor for 2 to 3 minutes in the soap solution.
4. Use a small bristle brush, cotton swab (Q-tip), or pipe cleaner to scrub the entire measuring end of the sensor, thoroughly cleaning the electrode surfaces. If detergent solution cleaning cannot remove surface deposits, use muriatic acid (or another dilute acid) to dissolve the deposits. The acid should be as dilute as possible, but yet strong enough to clean. Experience will help determine which acid to use and how dilute it can be. Some stubborn coatings may require a different cleaning agent. For assistance in these difficult cases, contact the OMEGA Service Department.

   Before cleaning with acid, determine if any hazardous reaction products could form. (Example: A sensor used in a cyanide bath should not be put directly into a strong acid for cleaning because poisonous cyanide gas could be produced.) Acids are hazardous. Wear appropriate eye protection and clothing in accordance with Material Safety Data Sheet recommendations.

   Soak the sensor in dilute acid for **no more than 5 minutes**. Rinse the sensor with clean, warm water and then place the sensor back into the mild soap solution for 2 to 3 minutes to neutralize any remaining acid.
5. Rinse the sensor in clean, warm water.
6. Calibrate the analyzer using the procedure in the analyzer instruction manual. If calibration cannot be attained, check the sensor using the procedure in Part Three, Section 2.1.

SECTION 2
TROUBLESHOOTING

2.1 Checking Sensor Operation

Use the troubleshooting section in the analyzer instruction manual to determine whether the sensor or analyzer is inoperative. If you suspect the sensor, check it using the following procedure:

1. Disconnect the sensor from the analyzer (or junction box, if using interconnect cable).
2. Clean the sensor using the procedure in Part Three, Section 1.
3. Using an ohmmeter, check all of the measurement point resistance readings shown in Table A below.

NOTE: *Be sure that the ohmmeter is set to its highest range for all infinite (open circuit) resistance readings shown in Table A.*

Table A -- SENSOR OPERATIONAL (RESISTANCE) CHECKS

Measurement Points	Correct Resistance Readings
Between blue and white wires	1089-1106 ohms at 23-27°C
Between red wire and sensor body	Less than 5 ohms
Between black wire and inner electrode	Less than 5 ohms
Between black and red wires	Infinite (open circuit)
Between black and white wires	Infinite (open circuit)
Between red and white wires	Infinite (open circuit)
Between red and outer shield wires	Infinite (open circuit)
Between black and outer shield wires	Infinite (open circuit)
Between white and outer shield wires	Infinite (open circuit)
Between outer and outer shield wires	Infinite (open circuit)

4. If you cannot get the required readings for one or more of the resistance checks in step 3, the sensor is probably inoperative. Refer to OMEGA's warranty/replacement plan on page 4 for sensor replacement details. If all resistance checks are okay, the sensor may still be inoperative. In this case, more extensive troubleshooting is required. Please consult the OMEGA Customer Service Department for details.

2.2 Customer Assistance

If you need assistance in troubleshooting or repair service, please contact our OMEGA Customer Service Department at: 1-800-622-2378 or 1-203-359-1660.

All sensors returned for repair or replacement must be freight prepaid and include the following information:

1. A clearly written description of the malfunction.
2. Name of person to contact and the phone number where they can be reached.
3. Proper return address for shipping sensor(s) back. Include preferred shipping method (UPS, Federal Express, etc.) if applicable.
4. A purchase order if sensor(s) is out of warranty to cover costs of repair.

NOTE: *If the sensor is damaged during return shipment as a result of inadequate packaging, the customer assumes responsibility for repair costs. It is recommended to use the original OMEGA shipping carton or an equivalent. Also, OMEGA will not accept sensors returned for repair or replacement unless they are thoroughly cleaned and all process chemicals are removed.*

MADE IN USA

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a registered trademark of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

Shop online at www.omega.com

TEMPERATURE

- Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- Wire: Thermocouple, RTD & Thermistor
- Calibrators & Ice Point References
- Recorders, Controllers & Process Monitors
- Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gages
- Load Cells & Pressure Gages
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
- Totalizers & Batch Controllers

pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
- Industrial pH & Conductivity Equipment

DATA ACQUISITION

- Data Acquisition & Engineering Software
- Communications-Based Acquisition Systems
- Plug-in Cards for Apple, IBM & Compatibles
- Datalogging Systems
- Recorders, Printers & Plotters

HEATERS

- Heating Cable
- Cartridge & Strip Heaters
- Immersion & Band Heaters
- Flexible Heaters
- Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- Metering & Control Instrumentation
- Refractometers
- Pumps & Tubing
- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
- pH, Conductivity & Dissolved Oxygen Instruments

M3575/0203